Outline

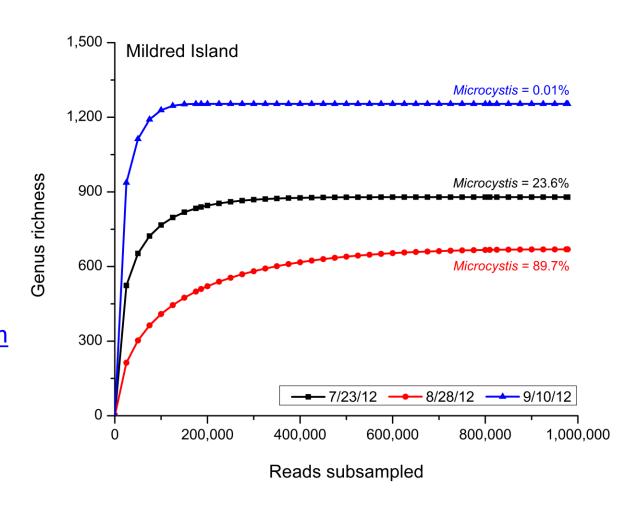
- Illustrations of complexity
- Conflicts and contradictions
- What we have learned

System complexity

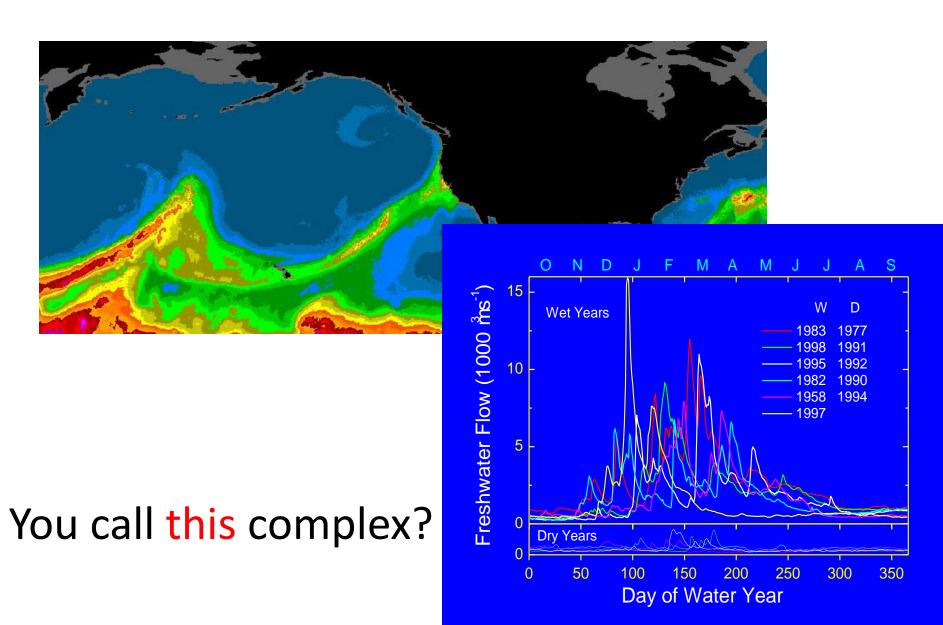
~170 fish species, ~70 zooplankton species, etc....

Thousands of microbes!

Graph courtesy of Dr. Tim Otten: www.bendgenetics.com



System complexity



System complexity

Number of species in Delta something like:

40

 \times 30 \times 35 \times 50 \times

1000!

Number of Individuals in Delta something like:

 $\times 10^{8}$

 10^{10}

 10^{12}

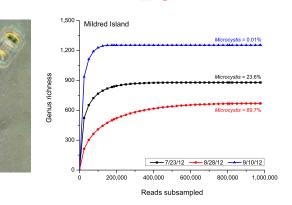
 10^{15}





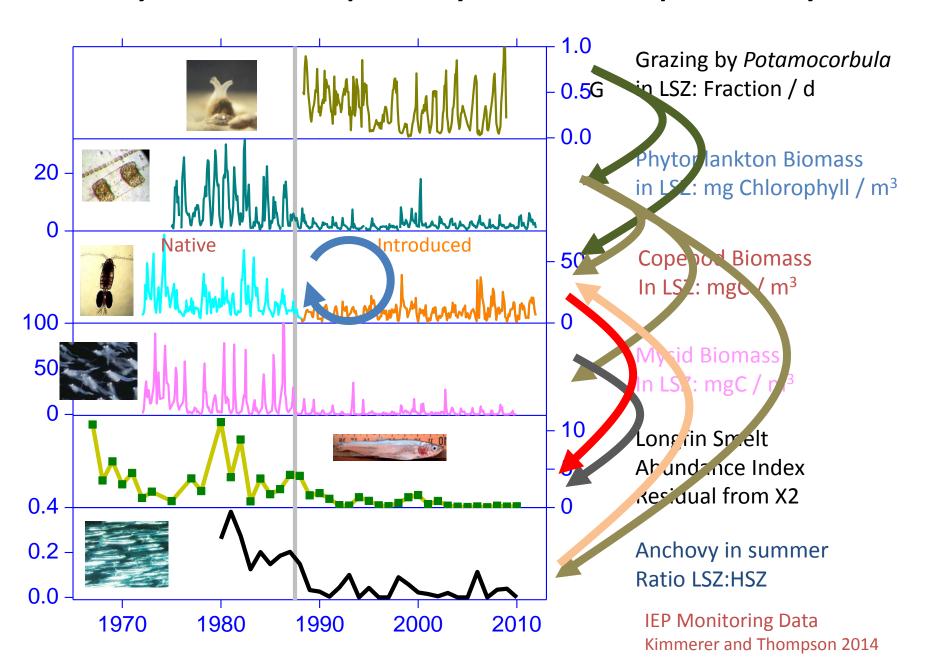






I call this complex!!

System complexity: Twisted pathways



Conflicts and contradictions Resolving major questions

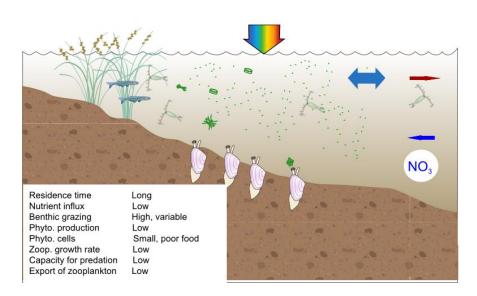
- Effect of pumping on fish populations
- Importance of food limitation
- Moving point of diversion
- Resolving the ammonium question
- Body count inadequate for ecosystem-level questions
- Value of restored marshes to pelagic fish

Shallow habitat: alternative scenarios

High production and export

Tidal Plankton flux exchange Nutrient flux NO₃ Residence time Moderate Nutrient influx Moderate Benthic grazing Low Phyto, production High Phyto. cells Large, nutritious Zoop, growth rate High Capacity for predation High Export of zooplankton Moderate

Low production and export



What we have learned

- A lot!
- Low-salinity habitat better understood
- Some effects of export pumping
- Turbidity effects (except mechanism)
- Expect surprises
- A complex system yields its secrets slowly

Cache Slough 2013 (continued 2015...)

